

PATHOLOGY AND BACTERIOLOGY

UNDER THE CHARGE OF

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An Investigation of the Cultural Reactions of Certain Anaerobes Found in Wounds.—The confusion in our knowledge of the anaerobic bacteria is reflected in the literature, the expanding nomenclature and the divided opinions on the importance of the various strains isolated from wounds. The investigation of HENRY (*Jour. Path. and Bact.*, 1917, xx, 344) has resulted in a definite clarification of the subject and will undoubtedly serve as a stimulus to further work along the same general lines. The fundamental importance of pure cultures in such a study and some practical methods for isolation of the more important anaerobes found in wounds are well brought out. The method of isolation makes use of the author's modified McLeod plate, attention being given to the special media and the careful technique found necessary, colony differentiation being practical after a little experience. Detailed descriptions of the more important anaerobes are given and methods of identification are clearly presented. The first and most frequently encountered is that of the *B. welchii* known under various names, viz., *B. aerogenes capsulatus*, *B. perfringens* (frequently used in the French and English literature), *B. phlegmonis emphysematose* of Fraenkel and a number of others. A subgroup, the *B. myxobacter* of Gruber and Bredemann, characterized by stormy fermentation of milk, in common with the *B. welchii*, and differing by its motility and the development of spores in milk, has not been found by the author in war wounds. The second group in point of frequency is the *B. sporogenes* (Metchnikoff). The name replaces *B. edematosus maligni* of Koch so long in use for this active proteolytic group of anaerobes and since the term malignant edema may indicate a clinical but certainly not a bacteriological entity, it is very much better to use the simpler name. In this group should also be included the *B. putrificans* (Bienstock) and the *B. endoantrax sporogenes* of Klein. The vibrio septique of Pasteur, so often included in the group by earlier writers, is not placed here by the author, but rather in the saccharolytic group. The name *B. tertius* is that chosen by the author for the oval end spore-bearing saccharolytic bacillus which has been found as the third most frequent anaerobe of wounds. The other names used by various writers for this organism are *Bacillus ix* von Hübner, *Rodella iii* and *Bacillus Y* of Fleming. The author also includes in his study a number of anaerobes isolated and described by Weinberg and Seguin, viz., *B. fallax*, *B. aerofetidus*, *B. edematis* and *B. histolyticus*. The fermentation reactions on a large number of carbohydrates is important and the author confirms the results of Simonds in the subdividing of *B. welchii*. In his discussion of the changes produced by anaerobes in the tissues the author points out the various conditions brought about in the wounds in modern

warfare, unavoidable, the soiling of the wound by earth or by clothing infected with fecal organism, the use of the short-range bullet and shrapnel shell, with the resulting extensive tissue damage. The anaërobes develop in damaged tissue just as they do in artificial cultures. The carbohydrate fermenters or saccharolytic group are the first to develop. The damaged muscle because of its carbohydrate content (about 1 per cent.) forms a favorable nidus for this growth. The glycogen of the living muscle is converted after death into dextrose and a small fraction of isomaltose, both of which are vigorously fermented by *B. welchii*. The author considers that the low sugar content in skin and subcutaneous tissue does not favor this development in wounds limited to these regions. The production of acid and gas results from this fermentation. The gas may appear clinically in four to six hours after the receipt of the wound and helps to embarrass the circulation. The organic acids bring about as one of the reactive changes an absorption of water by the protoplasmic colloids, and this combines with the exudate in the areolar spaces to form the edema so often seen in aerobic infections. This edema may spread far beyond the confines of the bacterial invasion. A second reactive change to the acid results in the appearance of antolytic enzymes both saccharolytic and proteolytic. The result of these various factors is a devitalization of the tissues. This early saccharolytic phase is followed in the wound, as in the test tube, by the proteolytic phase when the more slowly growing proteolytic group becomes established. The penetrating fetid odor so striking clinically in anaërobically infected wounds as well as the blackening of the tissue are both indications of the active presence of this second group. A third phase of toxemia and the last stage of anaërobic growth, the successful invasion of the blood, are rather briefly discussed. This article merits the careful attention of everyone interested in the bacteriology of war wounds. The illustrations are especially noteworthy.

Loss of Power to Produce Sarcomatous Transformation in the Stroma of Carcinoma.—WOGLOM (*Jour. Cancer Research*, 1917, ii, 471) premises that certain changes which have been found in the stroma of carcinomata are sarcomatous. This is not a constant possession of the carcinoma cell, for the Flexner-Jobling tumor lost this power between the fifth and eleventh generations. Similar findings have been reported in four other tumors. The neoplasm described by the author was found in the left inguinal lymph node of a female mouse of unknown age on March 17, 1914. The sarcomatous transformation of its stroma was lost after the fourth generation, and this power has not been regained up to the twenty-first generation. It recurred in one mouse in each of the first, second and fourth generations and in two mice of the third. The percentage of successful inoculations varied from zero to one hundred, and the growth was fairly rapid and usually continuous. The tumor type was an adenocarcinoma; alveolar areas were often encountered and keratinization was frequent. The stroma was not especially cellular. In the sarcomatous areas the characteristic halos of lightly stained cells encircling the cancer cells were seen. The author raises the interesting question "whether mouse tumors containing keratin may not, perhaps, induce sarcomatous development in their stroma more often than other types of carcinoma."

Complement-fixation in Experimental Trypanosomiasis.—It has been shown by a number of authors that the serum of animals infected with trypanosomes will give specific complement-binding with antigens prepared from the homologous trypanosomes or with certain organs of infected animals. Woods and Morris (*Jour. Infect. Dis.*, 1918, xxii, 43) studied complement-fixation with *T. equiperdum* with a view of determining the time of occurrence, the relation of the symptoms, its specificity and its relation to the Wassermann reaction, and to the effect of salvarsan. The antigen was prepared from the spleen tissue of infected rats. All of such antigens were not satisfactory because of the anticomplementary reactions. It was found that this antigen was as satisfactory as that prepared from the emulsion of the microorganisms. Seven healthy dogs giving negative reactions with these antigens were infected with trypanosomes. The fixation reaction appeared in about eight days. The trypanosomes appeared in the blood before the reaction became positive. In only one animal did a positive fixation test precede the appearance of the trypanosomes. The fixation appeared to be specific. As the trypanosomes multiplied in the blood stream the sera of the dogs became anticomplementary. A variable and inconstant fixation of complement with the Wassermann antigen was also obtained. It was difficult to follow the effects of arsenobenzol treatment upon the fixation test because of the anticomplementary reaction. In one dog, however, treatment not only removed the trypanosome infection but also dissipated the anticomplementary and complement-fixation properties of the serum. The authors were able to demonstrate that by the addition of disintegrated trypanosomes to normal dog serum a moderate anticomplementary serum was produced.

Experimental Trypanosomiasis: *T. Equiperdum* Infection in the Dog.—KRUMBHAR (*Jour. Infect. Dis.*, 1918, xxii, 34) in seeking for an agent to induce a slow destruction of the blood made use of the trypanosome which causes dourine in horses. This parasite he found was transmissible to dogs, inducing in them a fatal infection which, aside from his studies on blood destruction and regeneration, was of great interest. When once infected the blood of the dog readily transmitted the disease to new animals when given intravenously. There was an incubation period from three to eight days. With the appearance of the trypanosomes in the blood the animal showed weakness, loss of weight and progressive anemia. An irregularly disposed edema was not uncommon. Occasionally, also, eye lesions, such as keratitis, iritis and hemorrhages, were observed in the severe cases. Only twice were the manifestations suggestive of cerebral damage. With the appearance of the trypanosomes, signs of anemia manifest themselves both in the reduction of the hemoglobin and red cell count. The former may fall to 40 or lower while the latter is reduced to less than 3,000,000. A primary leukocytosis is followed by a leukopenia. Splenectomy was of no value in withstanding the infection. The author found that arsenobenzol was valuable in removing the infection and in bringing rapid improvement in the condition of the animal. They have found, however, that to ensure a permanent cure it is necessary to give three injections on successive days and to follow this with three or more injections at three-day intervals.